CARL T. JONES CORPORATION

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November 9, 1999

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Magalie Roman Salas, Secretary
Office of the Secretary, TW-A306
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

RE: Docket 93-177

Dear Ms. Salas:

Enclosed is the original and four additional copies of the Comments of Carl T. Jones Corporation in the Matter of an Inquiry into the Commission's Policies and Rules Regarding AM Radio Service Directional Antenna Performance Verification.

If any questions arise in this matter, please contact the undersigned.

Sincerely,

Carl T. Jones, Jr., P.E.
President

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List ABCDE

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
An Inquiry Into the Commission's	)	
Policies and Rules Regarding AM	)	MM Docket No. 93-177
Radio Service Directional Antenna	)	RM-7594
Performance Verification	)	

COMMENTS OF CARL T. JONES CORPORATION

Carl T. Jones Corporation is a consulting communications engineering company. The firm has provided engineering services to the broadcast industry for the past 64 years. Carl T. Jones Corporation ("CTJC") herein submits its Comments in response to the Notice of Proposed Rulemaking ("NPRM") in the above referenced proceeding concerning rules and policies pertaining to the performance verification of AM directional antenna systems.

Introduction

This proceeding originated in 1993 when the Commission issued a Notice of Inquiry ("NOI") seeking comment on appropriate changes in the rules governing directional antenna system verification. CTJC submitted comments and reply comments pertaining to several matters which are now the focus of this NPRM. Generally, CTJC supports the proposed changes set forth in the NPRM. The following discussion addresses several

technical proposals set forth therein as well as additional aspects related to the verification process for consideration.

Computer Modeling

We agree with and support the Commission's position to continue to rely on field strength measurements to verify directional antenna performance. We do not believe that the industry has identified, verified, and documented detailed procedures to allow accurate and repeatable computer modeling of directional antenna systems, which can be uniformly applied to a wide range of directional antennas and tower configurations, by engineers and technicians of varying educational background and experience.

With that said, we do believe that verification of certain classes of directional antenna systems, through the use of computer modeling, is possible within acceptable risks. We therefore support a Further Notice of Proposed Rulemaking under the present Docket to address the subject of verification of directional antenna performance by computer modeling.

Full Proof of Performance

The Notice proposes to: 1) reduce the minimum number of measurement radials required; 2) specify a maximum number of measurement radials for complicated arrays; 3) reduce the number of measurement points per radial; and 4) reduce the distance at which measurements are made.

Number of Radials

We support the Commission's proposal to reduce the number of radials required in a full proof of performance. We propose minor changes and clarifications to the proposal as described below.

Main Radiation Lobe - Determination of inverse distance fields in the main radiation lobe(s) of a directional pattern are performed primarily to establish the efficiency of the pattern and secondarily to establish pattern shape. Based on our experience, a single radial at the pattern maximum is sufficient to demonstrate that the pattern meets the minimum RMS requirement as specified in the Rules. In the case of a pattern with two equal maxima (peanut shaped pattern), symmetry can be assumed such that only a single radial is required in the direction of one of the pattern maxima.

Should the measured inverse distance field on the single main lobe radial fail to meet the minimum efficiency requirements, it is proposed that two additional radials be measured in the main lobe, one on either side of the main radial, to better estimate the actual RMS and establish any subsequent power increase.

If, as part of this Rulemaking, the Commission decides to delete the minimum efficiency requirements for directional antenna systems, there would remain no compelling technical reason to require that any field strength measurements be performed in the main radiation lobe. Under this scenario, we propose to delete the requirement altogether.

Minimum and Maximum Number of Radials - We agree with the proposed requirement to establish a minimum number of additional radials across the rest of the

pattern, which for simple patterns may or may not be exclusive of the main radiation lobe(s), to establish pattern shape and compliance with the standard pattern maximum radiation values. We also agree that radials should be selected in the direction of the pattern minima (typically specified by the Commission in the Construction Permit and/or License) and in the general directions of the peaks of the minor lobes of the pattern.

We have explored the idea of deleting the minimum radial requirement in lieu of requiring that radials be selected only at the pattern minima and minor lobe peaks. This idea was rejected for the reason that complex designs (requiring four and five towers) may result in critical shaping of the pattern at various azimuths toward other co-channel and adjacent channel stations without resulting in more than one pattern minima. With no minimum radial requirement, a proof of performance for such a complex pattern may consist of only two radials; hardly sufficient to demonstrate that the pattern shape has been achieved. For this reason, we support a minimum number of five additional radials across the "rest of the pattern" to verify pattern shape.

The Notice proposes a 90 degree azimuthal maximum between any two radials. We agree with and support this proposal, with the single clarification that this does not include the radial selected in the main lobe of radiation but rather pertains only to the radials comprising the "rest of the pattern".

We also support the establishment of a maximum number of radials and the limited use of symmetry, where applicable, to show compliance in cases where the maximum number of radials would be exceeded. We have conducted proofs of performance on

numerous patterns requiring as many as 14 to 18 measured radials under the current Rules. We believe that the proposed maximum of 12 radials strikes a reasonable balance between the resulting increased potential for interference versus reduced financial burden to the licensee.

Number of Points Per Radial, Length of Radial

The Notice proposes to reduce the minimum number of points to be measured per radial and to reduce the minimum radial length. We generally support these proposals with some clarifications as described below.

Number of Points Per Radial - In its discussion of the current Rules, the Notice states that "a permittee measure at least 30 points per radial at prescribed intervals to establish the directional and nondirectional field along each azimuth". We agree that this is the case for nondirectional measurements to establish the nondirectional inverse distance field and ground conductivity along the radial path. However, fewer points, in the range of 18 to 22 measurements, are required in the directional operating mode. Determination of the directional inverse distance field is typically based on a graphic or arithmetic comparative analysis of the directional and nondirectional field strengths.

The reason for the difference in the number of measurements between the nondirectional and directional operating modes is in the definition of the starting measurement location. In the nondirectional case, measurements can be made starting at a distance of five times the height of the nondirectional tower. Assuming a tower height

of 1/4 wavelength and an operating frequency of 1 MHz, for example, nondirectional measurements can and should be made starting at a distance of approximately 0.4 kilometers (km) from the nondirectional tower. In the case of directional measurements the nearest measurement point location can be made no closer than ten times the maximum distance between elements[1]. For example, assuming a four tower in-line array with 1/4 wavelength spacing, operating at 1 MHz, the closest directional measurement point is calculated to be 2.25 km. Following the prescribed measurement interval, this would result in 11 fewer directional measurement points than nondirectional measurement points.

In practice many engineers start the directional measurements at a distance of approximately 3 km from the center of the array for two reasons. First, this distance will generally insure that the first measurement location meets the minimum distance criterion discussed above, and second, the prescribed distance interval beyond 3 km is sufficient to allow access to the measurement locations by automobile.

In the Notice, it is proposed to reduce the number of points from a minimum of 30 to a minimum of 15, however, a review of the measurement intervals proposed suggests that greater than 15 measurement points are required. Using the example cited above, nondirectional measurements would be made at 0.2 km intervals between approximately 0.4 km and 3.0 km (13 points), at 1 km intervals between 3 km and 5 km (3 points), and

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[1]In extreme cases where access is restricted over large portions of a radial, near field correction of measurements made within ten times the maximum distance between elements has been accepted by the Commission in order to achieve the required number of points.

at 2 km intervals between 5 km and 15 km (5 points). Therefore, a total of 21 measurement locations are required for the nondirectional proof of performance. The directional proof of performance could be started at approximately 2.3 km, which, using the same measurement intervals, results in a total of 12 points at 15 km. Therefore a minimum of two additional points would have to be measured beyond 15 km to achieve the minimum of 15 points. The two additional points would also have to be measured in the nondirectional mode, resulting in a total of 23 measurement locations.

Although the total number of measurement locations is somewhat greater than 15, we believe that considerable savings can be achieved under the proposed criterion as a result of the shorter radial length in combination with the reduction in the total number of measurements required. Therefore, we support the proposed minimum number of directional measurements, the proposed measurement intervals, and the proposed criterion with regard to the starting distance for nondirectional and directional measurements. It is suggested that in any formulation of new Rules regarding field strength measurements, that differentiation be given to the discussion of nondirectional versus directional measurements to include the purpose of nondirectional measurements in evaluating directional pattern performance.

We also agree with the Commission that the close-in nondirectional measurements are of vital importance in evaluating the nondirectional inverse distance field and any subsequent analysis of the directional inverse distance field. For this reason any

proposed further reduction in the number of nondirectional measurement locations within the first 3 km should be rejected.

Length of Radial - We support the proposed minimum distance requirement of 15 km, with the added stipulation that measurements may be submitted beyond this distance. The new minimum distance requirement should not, in any way, diminish the importance of measurements made beyond this distance.

Measurement Point Data - We agree with the proposed list of data to be submitted with each measurement point as delineated in paragraph 18 of the Notice including the noticeable absence of any requirement to submit mapping of the measurement locations.

Partial Proof of Performance

We support the proposed reduction in the number of measurement points required for a partial proof of performance and the elimination of the requirement to conduct a partial proof of performance following replacement or modification of sampling system components mounted on the tower provided the new components are mounted in the exact location of the old components.

Monitoring Points

We strongly support retaining the monitoring point requirements. Measurement of the monitoring point field strengths represents the only direct measurement of pattern

performance after the proof of performance is completed and the only external measurement.

We do not support the elimination of the requirement to submit a partial proof of performance on the affected radial when requesting a new monitor point. The measurement of eight points on a single radial can hardly be considered burdensome in the rare instance of a monitor point change, yet it would provide critical information in determining whether the radiation on the radial remains within its standard pattern radiation limit. Good engineering practice would dictate that if a monitor point rises above the FCC established maximum, the first step in assessing the magnitude of the problem would be to measure the field strength at other points on the radial to establish whether the problem is isolated to the monitor point or impacts the entire radial.

We support the use of differential GPS coordinates in lieu of detailed routing descriptions and mapping indicating how to reach each monitoring point. This would ease the application process and eliminate the need to scan maps for future electronic filing. We agree with the proposal to maintain the requirement for monitor point pictures and detailed descriptions of the monitoring points such that FCC inspectors or other parties may accurately locate the monitoring points without the assistance of station personnel.

AM Station Equipment and Measurements
Base Current Ammeters

We support the Commission's proposal to delete the requirement for base current ammeters for those directional stations which employ an approved sampling system. For

towers below 110 electrical degrees, typical installations today employ toroidal transformers as sample elements at the base of each tower to measure the relative magnitude and phase of the base current. It is clearly unnecessary to require a second toroidal transformer or thermocouple ammeter, to be mounted immediately adjacent to the sample element, to measure the same operating parameter as measured by the sampling system.

Many stations having towers greater than 110 electrical degrees use a single-turn loop as a sample element. The loop is side-mounted to the tower, typically well above the base. In this case, the base current ratio is a secondary measurement which is sensitive to changes in the immediate vicinity of the tower base. Because of this sensitivity, many times the base current ratios will drift out of licensed tolerance while the sample parameters and pattern shape remain well within tolerance. This unnecessarily triggers the expense of a partial proof of performance and an Application for Direct Measurement of Power to modify the licensed base current ratios.

Voltage Sampling

We support permitting voltage sampling as an alternative to the present technique of sampling the current at the base of a tower or at a point along the length of the tower. Voltage sampling can provide information more closely related to the performance of the directional antenna (dependant on height) with the added potential advantage of being less sensitive to changes in the immediate vicinity of the tower base.

Impedance Measurement Across a Range of Frequencies

We support the proposal to delete the requirement to perform impedance measurements across a span of ± 25 KHz for stations employing directional or nondirectional antennas. At this point in time, we can think of no technical or regulatory reason to maintain such a requirement.

Common Point Impedance

We support the proposal to delete the requirement that the common point reactance be zero. In most cases, the common point bridge and ammeter are located such that a significant amount of tubing is required to electrically connect the common point to the transmitter or to a transmission line connected to the transmitter. The RF tubing presents an additional inductive load such that when the common point load is set to zero Ohms reactive, the actual transmitter load may be several ohms inductive. For this reason the common point reactance is set several Ohms capacitive to cancel the added inductance of the tubing. If several RF contactors are required between the common point and the transmitter, the added inductance can be ten Ohms or greater. Since power determination is dependant only on the common point current and resistance there is no technical reason to require any limitation on the common point reactance. Therefore, we support the proposal to eliminate the requirement that the common point reactance be set to zero Ohms and, further, recommend that no limit be imposed on the absolute value of the common point reactance.

Critical Arrays Designation

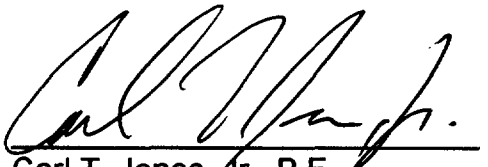
The Notice proposes a more equitable and reasonable method of designating critical arrays through: 1) evaluating all new nighttime applications prior to grant of a Construction Permit; and 2) relaxing the current critical array threshold requirements. Under the current procedure, critical array designation is only triggered by a petition or objection filed by a party in interest to a pending application for a new or changed facility. We agree that the current method of designating critical arrays is inequitable and in many cases the motivation of the petitioner is punitive rather than born out of any concern for actual interference. However, we question the wisdom of burdening many more stations than currently bear this significant burden for the sake of equitable treatment.

We agree with the Commission's determination that the current designation threshold is too stringent, however, we are not convinced that the proposed threshold has been relaxed to the point of correlating with the potential for real world interference. Considering the variables involved it is difficult to draw this conclusion. For example, exceeding the standard pattern in one, or for that matter even ten directions, may or may not result in interference to another station. The amount of time that a station might exceed the standard pattern in a given direction appears to be an important parameter which is not directly addressed by the evaluation technique. Further, our experience has shown that the magnitude of parameter variation is significantly greater on low power towers as compared with higher power towers, yet the proposed evaluation technique

gives equal weight to all towers. This single factor may, on its own, result in a significant overestimate of the interference potential under the proposed criterion.

It would appear that the critical array evaluation criterion is a complicated issue and we are not prepared to offer a concrete proposal. However, we suggest that the Commission consider an alternative approach of adopting a minimum design criteria for stability, such as, for example, the 0.1%/0.1 degree pass/fail criterion suggested in footnote 32 of the Notice, in combination with the elimination of the critical array designation. This would eliminate the authorization of any new highly unstable arrays while allowing equal treatment of all existing arrays and all new arrays which meet the new design criterion.

DATED: November 9, 1999



Carl T. Jones, Jr., P.E.
President